Citation:

Wang Y, Ge K, Popkin BM. Why do some overweight children remain overweight, whereas others do not? *Public Health Nutr.* 2003 Sep;6(6):549-58.

PubMed ID: 14690036

Study Design:

Cohort (longitudinal, prospective)

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the dynamic patterns of overweight among Chinese children and their predictors, focusing on the influence of dietary intake on tracking of overweight.

Inclusion Criteria:

- Children who were initially overweight at baseline and were re-surveyed two years later.
- *Child overweight:* BMI greater than or equal to 25 kg/m^2
- *Parent overweight:* BMI greater than or equal to 25 kg/m^2
- *Parent underweight:* Less than 18.5 kg/m^2.

Exclusion Criteria:

Physical absence from the study.

Description of Study Protocol:

Recruitment

- Participants were part of a longitudinal study, the China Health and Nutrition Survey (CHNS).

Design

- Data collected:
  - Anthropometric measurements (weight, height, triceps skinfold thickness, arm circumference) from children and their parents.
  - Household food consumption data and individual dietary intake data for three consecutive days. For children under 10 years old, mothers reported their dietary

intake.
    - Food groups were separated into:
        - Grains, cereals and products
        - Vegetables and fruits
        - Animal source products
        - Cooking oil, seasoning and other condiments
        - Other.
- Computed children's total energy intake as a "percentage of the Chinese Recommended Dietary Allowances."
- Based on children's BMI, researchers examined
    1. The dynamic patterns of overweight status between 1991 and 1993
    2. The differences between overweight tracking and non-tracking groups.
- Groups:
    1. Overweight to overweight (tracking of overweight)
    2. Overweight to non-overweight (non-tracking of overweight)
    3. Non-overweight to overweight (development of overweight)
    4. Non-overweight to non-overweight (not overweight either year).

Statistical Analysis

- Analyses of variance using General Linear Models (differences between groups, adjusted for age and gender), Cochran-Mantel-Haenszel test (differences in categorical variables; association between tracking of overweight and tracking of dietary intake patterns; compare two groups' experience during follow-up, i.e. for changes in dietary intake and growth in height and weight).

Data Collection Summary:

Timing of Measurements

- Surveyed at baseline (1991) and follow-up (1993).

Dependent Variables

- BMI.

Independent Variables

- Baseline fat and carbohydrate intake, tracking of overweight and tracking dietary intake patterns.

Control Variables

- Age
- Gender.

Description of Actual Data Sample:

Initial N

- 1535.

Attrition (final N)

- 95.

Age

- Six to 13 years at baseline.

Ethnicity

- Chinese.

Anthropometrics

- At baseline, mean age was 9.4±2.2 and mean BMI was 16.2±3.1
- 47.2% were female and 24.1% lived in urban areas.

Location

- China.

Summary of Results:

- 36.8% of the 95 overweight children remained overweight in 1993.

Urban vs. Rural

- Urban overweight boys were almost three times more likely to remain overweight than their rural counterparts (63.2% vs. 21.9%, $P<0.05$).
- Urban overweight girls were less likely to remain overweight than rural girls, but the difference was not significant (28.6% versus 37.8%, $P>0.05$).

Diet

- The overweight tracking group (children who were overweight at baseline and remained overweight over the course of the study) had a significantly higher percentage of energy derived from dietary fat intake (23.6% vs. 19.1%), but a lower percentage of energy from carbohydrates (64.0% vs. 68.9%).
- There was no significant association between total energy intake and BMI or between total fat (grams) and BMI.
- The tracking group was heavier and had higher BMI than the non-tracking group ($P<0.05$). Overweight children who had a high-fat diet ($P<0.1$) or a high meat diet ($P<0.05$) were more likely to remain overweight, but those who had a high-carbohydrate or a high-VF diet were at a lower risk ($P<0.05$).
- Tracking of overweight was associated with tracking of dietary intake patterns. Children who maintained a high-meat diet (RR 2.4, CI 1.0-5.6, $P<0.05$) or a high-fat diet (RR 1.5, CI 0.9-2.5, $P<0.1$) were more likely to remain overweight.
- When children's baseline BMI and corresponding baseline dietary intake were also adjusted, the differences in fat and carbohydrate intakes between the two groups became significant ($P<0.05$).
- The overweight tracking group grew faster in weight, but slower in height than the non-tracking group during the follow-up. The ratio of growth in weight-to-height was 0.9 vs. 0.2. Non-overweight children who became overweight in 1993 grew slower in height, but faster in weight than the other three groups.

Author Conclusion:

Despite considerable changes in children's overweight status during childhood and adolescence and equally remarkable shifts in diet and socioeconomic factors, the dietary intake patterns of Chinese children appear to influence the dynamics of childhood overweight.

Reviewer Comments:

Limitations

- *Use of IOTF reference to define overweight might have underestimated the tracking proportion.*
- *Small sample size does not provide adequate statistical power.*
- *Overweight children may have changed their energy intake during the follow-up.*
- *Could not measure TEI accurately, while measures of diet consumption (percentage of energy from fat) may be a better indicator of children's actual energy intake levels.*
- *Data on physical activity were not collected.*
- *Could not examine how genetic factors might influence tracking of overweight.*

Other Comments

- *No controlling for total energy intake, physical activity/inactivity, etc.*
- *Very difficult to understand the methodology, results and conclusions from this study (language barrier, translation difficulties?)*
- *Small sample size, therefore no logistic regression performed.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes

1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes

4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes

7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	???
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes